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## (54) Plastics bristle

(57) In order to indicate wear of plastics bristles for brushes, paint brushes or the like, a plastics bristle 1 is formed by a supporting core 3 inserted into a working layer 2 concentrically surrounding the core 3 and closed at one end. The core 3 and working layer 2 consist of plastics materials, which are differently coloured and, if appropriate, are of different types of plastics. The cover 2 is formed by an injection moulding or stamping process and the core is inserted into the cover or moulded in situ. When using an implement, provided with plastics bristles 1 of this type, the expiry of useful life can be recognized when the differently coloured core is exposed.

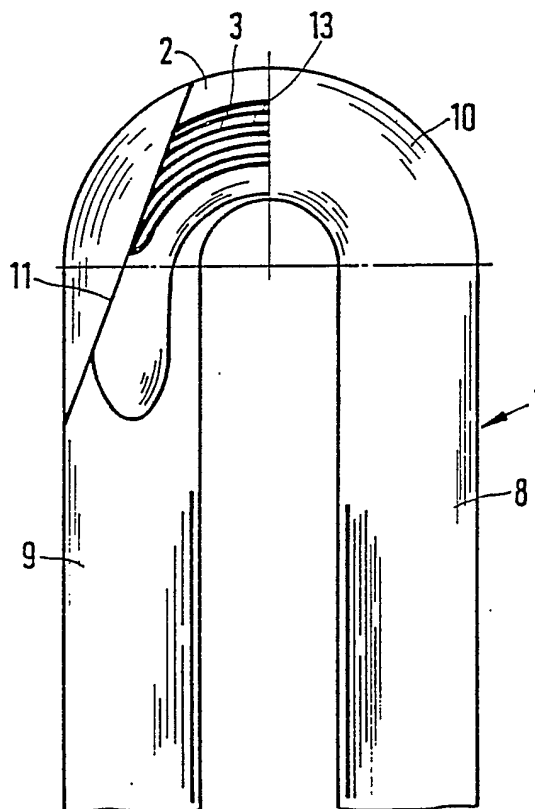
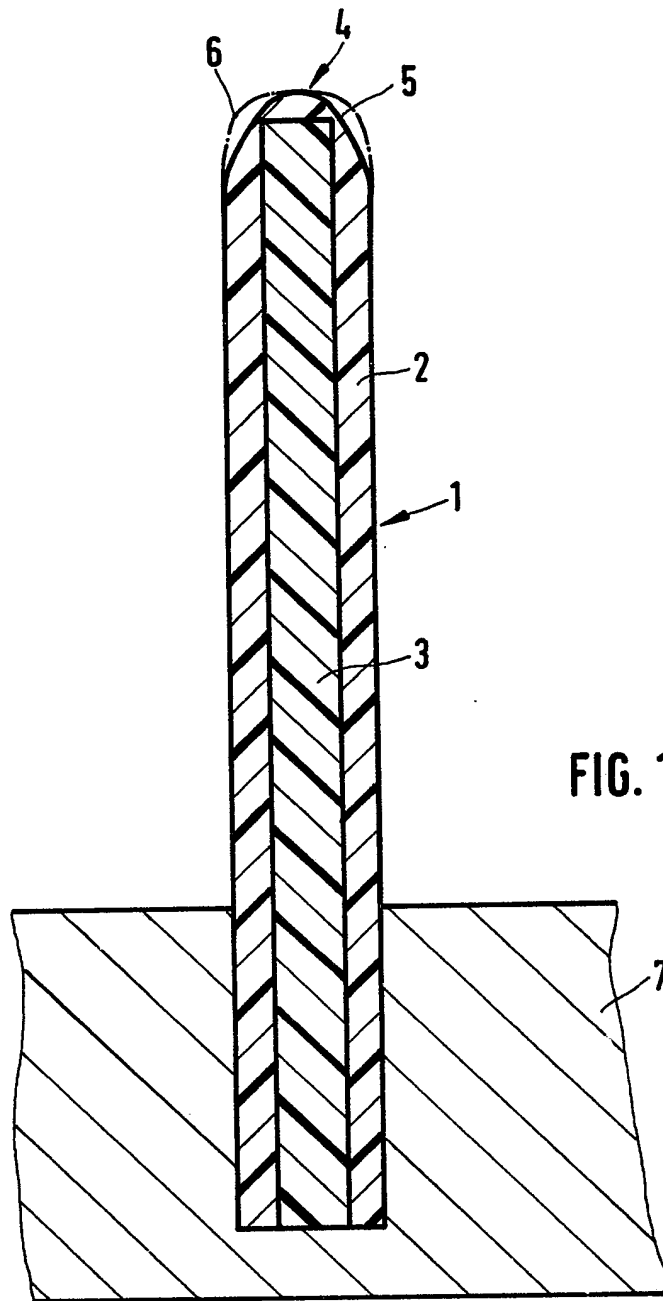


FIG. 2



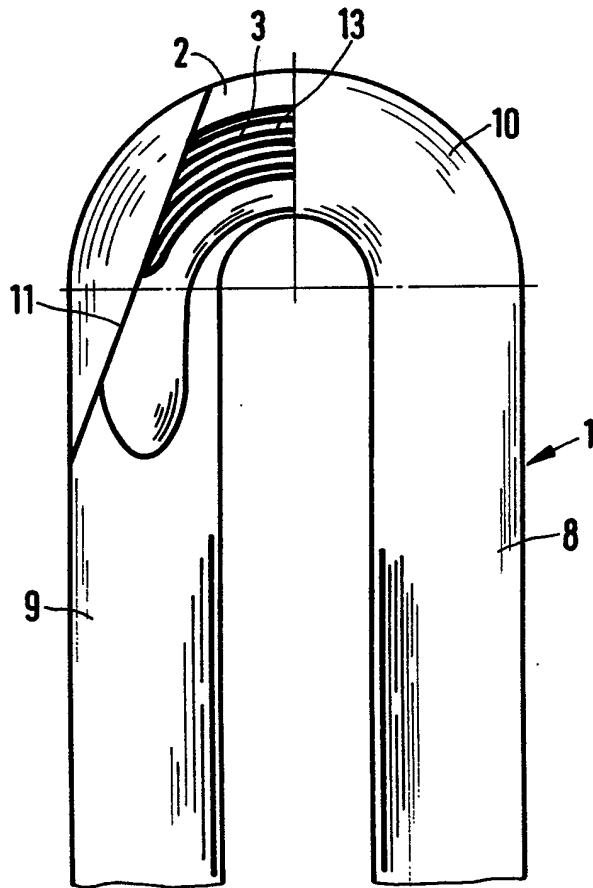


FIG. 2

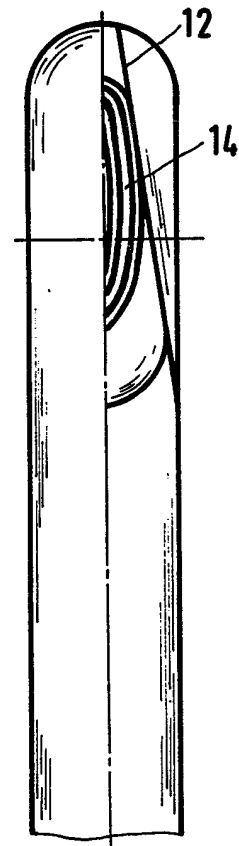


FIG. 3

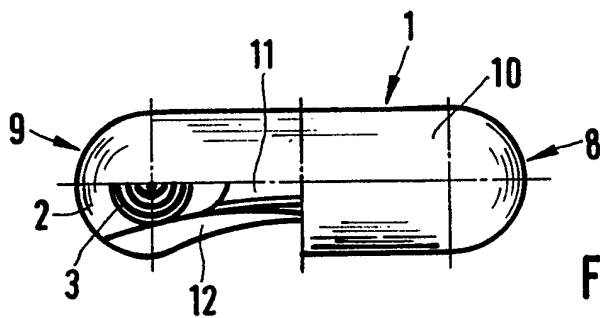


FIG. 4

## SPECIFICATION

### Plastics bristle

The invention relates to a plastics bristle for brushes, paint brushes or the like, consisting of a supporting core and a working layer, surrounding the latter in a concentric manner, whose material is adapted to the required purpose.

In the case of implements provided with bristles, e.g. brushes, paint brushes or the like, the question of perfect functioning of the bristles is essential. It is known that plastics bristles wear away unevenly at their ends with increasing use and thus, for example, become pointed, which in many instances of use is undesirable. This applies, for instance, to tooth brushes, since worn pointed bristles are a danger to the mucous membrane of the mouth. The same applies, for example, to polishing brushes, since the surface to be treated may be damaged by pointed ends or resulant burrs.

Furthermore, these types of implements become unusable when the bristles are constantly deformed, for example, bent, i.e. they lose their resilience or ability to straighten out again. In this case the whole set of bristles becomes too soft, so that they can no longer function reliably.

For many applications, a compromise has to be made in selecting the material for the plastics bristle. Thus for many purposes a relatively soft material is desired. On the other hand the bristles has to be sufficiently stiff so that it does not bend over in use. These two requirements can only be met with great difficulty.

Attempts have already been made to produce these two properties in a plastics bristle by making it from a supporting core and a covering forming a working layer, the covering being formed from relatively soft plastics material, whereas the core is formed from plastics material, which is less flexible with respect thereto, see U.S. Reissue Specification No. 26 688. In this bristle, the core and the working layer consist of the same plastics material, which, however, has been made or treated differently, e.g. made of plasticized and unplastitized polyvinyls, high pressure or low pressure polyethylene or polypropylene. In this connection the bristles is made by coextrusion of the two materials, the working layer being formed from the softer plastics and the core from the harder plastics. This proposal is based on the knowledge that in coextrusion, usable products result only if the plastics are similar. It is further proposed to make the core continuously, in the manner which is usual when manufacturing bristles, and to coat it with the covering, by immersing it into a solution or a melt of a similar plastics, or else to foam the covering onto the core.

It is further known German Specification No. 1 072 434 to spray a polyethylene covering onto a continuously produced polyamide bristle in an extruder. This too, allegedly prevents the known forming of burrs in polyamide bristles and also water absorption of the polyamide core. In both

cases, the core has primarily a supporting and reinforcing function, whilst the working layer, formed by the covering, is primarily adapted to the intended use.

Practical tests with bristles of this type have shown that they can only be produced either with great difficulty or at considerable cost and fulfill their purpose less than satisfactorily. Although the individual bristles may be sufficiently stiff and have a good ability to straighten out again, the above-mentioned disadvantages of becoming pointed and forming burrs re-occur once the working layer is worn at the bristle ends and the core, which is harder, is exposed. This can result in even greater damage than in conventional monofilament bristles.

Therefore, implements of the above type — independently of the structure of the bristle — are usually used until the user establishes from appearance that the desired result, e.g. the cleaning, abrasive or polishing effect is no longer obtained or the bristles of the implement have simply become unsightly.

An aim of the invention is to provide a plastics bristle which on the one hand, meets all requirements relating to use, and on the other hand, helps prevent an implement, provided with plastics bristles, from being used too long and thus causing damage.

This object is achieved according to the invention in that the core and the working layer are formed by different coloured materials and in that the working layer is made as a cover, closed at one side, into which the core is subsequently inserted.

Since the outer cover is closed and therefore surrounds the core completely, the colour of the bristles is determined by the colour of the cover material. The bristles, therefore, are seen as a uniform colour. Furthermore, the entire working surface of the bristle is formed exclusively by the cover material, which is adapted to the specific or intended use. On the other hand, the core has, as is known *per se*, essentially only a reinforcing effect, therefore it determines the rigidity of the bristle and its capacity to straighten out again. During use, the working layer is gradually worn away, principally in the area of the free end of the bristle. After a certain period of use, the differently coloured core becomes noticeably visible and this indicates to the user that the normal period of use has elapsed. If the user attaches importance to a perfect work result, this indicates to him that the implement is unusable. If he does not heed this automatic indication and makes further use of the implement, generally there will be no damage, but he will have to accept a worse end product.

As the cover generally consists of a softer material than the core and is closed at the end forming the bristle and, no burrs or points can occur before the cover material is worn away. Only after the end is worn away is the core, which is relatively hard and therefore results more easily in damage, exposed, which, however, indicates to the user, by its different colour, that the brush is

unusable. When the bristle is pressed against the surface to be treated, the core, i.e. its front end, acts as an abutment for the working layer in the area of its end.

- 5 In a preferred embodiment of the invention, the cover is made by an injection moulding or injection stamping process, whereas the core is produced continuously, cut to size and inserted into the cover, or is produced by filling the cover  
10 with a castable plastics.

- Practical tests have shown that only the above-mentioned production technique results in a usable plastics bristle. In the injection moulding process the cover is made between the mould and  
15 the core in its final form, whilst in the injection stamping process the plastics is injected into the mould and subsequently a die, moulding the cavity of the cover, is brought into place. In both processes no chemical or mechanical connection,  
20 which has proved unnecessary also in practical use, takes place between the cover and the core. Naturally, the tools are to be designed so that the core sits as snugly as possible in the cover.

- The preferably used injection moulding or  
25 injection stamping process enables the cover to be formed in a rounded-off manner at its closed end, as a result of which the bristle has particularly favourable properties of use. Although even this has already been proposed in two-part plastics  
30 bristles, in the case of coextrusion (U.S. Reissue Specification No. 26 688) and also when extruding and subsequently injecting (German Specification No. 1 073 434), a separate treatment e.g. heat treatment of the bristle end, is  
35 however, always necessary. In view of the very small diameter of these types of plastics bristles, however, it is not possible to maintain consistently good quality at the bristle end by means of heat treatment.

- The injection stamping process creates the further possibility of making the wall thickness of the cover at the transmission point from the cylindrical area into the rounded-off end or in the  
40 area of this end less than in the cylindrical area and forming the end of the core in a rounded-off or sharp-edged manner.

In this preferred embodiment, the cover of the wall, therefore, is thinnest in the transition area into the rounded-off end.

- 50 During use the cover becomes worn principally at this thinnest point. Once the material has worn away completely at this point, the front end of the cover peels off, so that the indicating core is suddenly exposed and immediately and clearly  
55 indicates to the user that the bristle is worn.

- The core of the plastics bristle formed according to the invention can also be formed by one or more bristles made of conventional material. In this way the mechanical properties,  
60 such as rigidity etc. in particular are influenced.

- The invention offers the further possibility of adapting the cover thickness and/or material to the allowable period of use. This period of use is nowadays empirically known for different  
65 materials and different uses of bristles. The

invention enables the values to be utilized suitably by constructing the cover appropriately with respect to form and material.

- In the embodiment of the plastics bristle  
70 suitable for abrasive brushes, the cover consists of a plastics material filled with abrasive particles. In this case too, the special advantage of the invention can be seen, in that only the cover material has to be adapted to the particular use,  
75 whilst the rigidity of the bristles and their capacity to straighten out again can be determined by choosing the core material accordingly.

- Likewise in plastics bristles for polishing brushes, the cover can consist of a plastics material  
80 filled with a polishing agent.

In both cases the unusability of the abrasive or polishing brush is automatically indicated as soon as the core material is exposed.

- In a further embodiment the cover and, if  
85 necessary, the core can consist of a plastics material filled with carbon particles. This embodiment principally has the advantage that static charges are avoided. Plastics bristles of this type are particularly suitable for those brushes  
90 which are used dry, for example hair brushes, clothes brushes etc.

- Instead of being formed in a straight line the plastics bristle can be bent in a V or U shape, the curves of the individual bristles within a set of  
95 bristles in each case forming the free end thereof. In this case too, the plastics bristle firstly wears away in the area of the cover and it is only after this has worn that the core material is exposed.

- Normally, brushes, paint brushes or the like will  
100 be formed wholly and uniformly from the plastics bristles according to the invention. However, it is also possible to arrange individual plastics bristles, formed according to the invention, within a set of other bristles, either arranged individually or in  
105 entire partial areas of the set of bristles, e.g. in the areas where the bristles are subject to the greatest wear.

- This arrangement, individually or over entire areas, of the plastics bristles also indicates to the  
110 user in good time that the implement has become unusable.

The invention will be further described by way of example, with reference to the accompanying drawings, in which:

- 115 Figure 1 shows a longitudinal section through a plastics bristle according to the invention, inserted into a carrier;

- Figure 2 shows a side view of a plastics bristle according to the invention, bent in a U-shape, with  
120 the worn part indicated;

Figure 3 shows a view of the plastics bristle of Figure 2, turned through 90°, and

Figure 4 shows a view of the end of the plastics bristle according to Figure 2.

- 125 The plastics bristle 1 consists of a working layer 2 and a core 3. The core 3 is made from a comparatively rigid plastics, whereas the working layer 2 consists of a plastics which is adapted to the specific purpose, e.g. soft plastics. In the case  
130 of a tooth brush for example, the core 3 can

consist of nylon and the working layer 2, on the other hand, of a soft polyvinylchloride or polyethylene.

The core can be continuously produced like a conventional bristle and cut to length, whereas the working layer 2 is produced in the form of a cover by an injection moulding or injection stamping process.

The cover 2 is closed at its free end 4 and is rounded at this end. Various possible radii of curvature which can be produced in the injection moulding or injection stamping processes, are indicated by 5 and 6. As can be seen from the drawing, the wall thickness can be reduced in the area of the free bristle end, more particularly in the rounding area or at the transition point between the cylindrical and rounded-off area. This can be achieved in particular in the injection stamping process. This reduced wall thickness results in correspondingly more rapid wear and in sudden exposure to the end of the core 3.

Independently of the type of plastics used for the cover 2 and the core 3, the latter are dyed different colours, usual dyes being used for the material of the cover, whereas the core material 3 should, in any case, have a colour which differs greatly therefrom so that after the cover 2 has worn away and the core material has been exposed, the wear of the bristle is indicated. This indication can take place suddenly by means of the previously described thin points in the wall thickness, by the remaining cover material breaking off at the free end of the bristle when the cover becomes worn at these thin points.

The bristle 1 is inserted by means of its end, opposite the rounded-off end, into a carrier 7 in the conventional manner. For this purpose there are various manufacturing techniques, which can all be used even in the case of the plastics bristle formed according to the invention.

In the embodiment according to Figures 2 to 4 the individual plastics bristle is bent in a U-shape so that it forms two limbs 8,9, which are connected by way of an arch 10, forming the free end of the plastics bristle. In the drawings, two planes of wear 11 (Fig. 2) and 12 (Fig. 3) are indicated, the core 3 being shown in the plane of wear 12 in the form of a partially annular section 13 (Figure 2) whereas it is represented in the plane of wear 11 as an oval structure 14 (Figure 3).

#### CLAIMS

1. A plastics bristle for brushes, paint brushes or the like, comprising a supporting core and a working layer surrounding the core and formed of material adapted to the intended use,

characterized in that the core and the working layer are formed from differently coloured materials and in that the working layer is made as as a cover, closed at one end, into which the core is subsequently inserted.

2. A plastics bristle according to claim 1, characterized in that the cover is produced by an injection moulding or injection stamping process, and the core is produced continuously, cut to size and inserted into the cover, or is formed by filling the cover with a castable plastics.

3. A plastics bristle according to claim 1 or 2, characterized in that the cover is rounded off at its closed end.

4. A plastics bristle according to any one of claims 1 to 3, characterized in that the wall thickness of the cover is less at the transition point from the cylindrical area into the rounded-off end or in the vicinity of this end than in the cylindrical area and in that the core is formed at its end in a rounded-off or sharp-edged manner.

5. A plastics bristle according to any one of claims 1 to 4, characterized in that the core is formed by one or more bristles.

6. A plastics bristle according to any one of claims 1 to 5, characterized in that the cover is adapted in thickness and/or material to the permissible period of use.

7. A plastics bristle according to any one of claims 1 to 6, in particular for abrasive brushes, characterized in that the cover consists of plastics material filled with abrasive particles.

8. A plastics bristle according to any one of claims 1 to 7, in particular for polishing brushes characterized in that the cover consists of plastics material filled with a polishing agent.

9. A plastics bristle according to any one of claims 1 to 8, characterized in that the cover and, if appropriate, the core, consist of plastics material filled with carbon particles, e.g. with carbon black.

10. A plastics bristle according to any one of claims 1 to 9, characterized in that it is bent in a V-shape or U-shape.

11. A set of bristles for brushes, paint brushes or the like, characterized in that only individual plastics bristles of the set of bristles is formed according to one of claims 1 to 10.

12. A set of bristles according to claim 11, characterized in that the plastics bristles, formed according to one of claims 1 to 10, are disposed only in partial areas of the set of bristles, e.g. in the areas of the set of bristles subject to the greatest amount of wear.

13. A plastics bristle substantially as hereinbefore described with reference to Figure 1 or Figures 2, 3 and 4 of the accompanying drawings.